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Original Research Article

Utility of local flaps in the reconstruction of oncologic resection defects of the oral cavity

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ABSTRACT

Background: Objectives of the study were: to report on the utility of local flaps for oral cavity reconstruction in patients undergoing radical surgery for oral cavity cancers, to enumerate different local flaps used for oral cavity reconstruction, and to assess survival and sequelae associated with various flaps.
Methods: The study is a retrospective analysis of data on patients with oral cancer treated with resection and local flap reconstruction between January 2018 to February 2021. The study includes patients treated at a tertiary care cancer hospital in South India. Patients of oral cancer who underwent resection followed by local flap reconstruction between January 2018 to February 2021 were included. Data was analysed for the extent of resection and type of flap used. Details of flap outcomes in the form of major and minor flap loss, functional outcomes and sequelae if any, were documented.
Results: 46 patients, 15 women and 31 men, were included in our series. The median age was 51.5 years with an interquartile range (IQR) of 20.5. Tongue was the most common subsite (n=26; 56.5%) followed by buccal mucosa (n=7; 15.2%). Of the 46 flaps done, the most commonly employed flap was the facial artery myo-mucosal flap (FAMM flap) (n=27;58.6%) followed by the nasolabial flap (n=7;15.2%). There was no case of complete flap loss. Grade II trismus (n=5) was the main sequela observed in this study.
Conclusions: Local flaps are a reliable option in oral cavity reconstruction post oncologic ablation.

Keywords: Local flaps, Facial artery flap, Nasolabial flap, Infrahyoid flap, Estlander flap oral cancer, Reconstruction, Oncology, Ablation

INTRODUCTION

The burden of oral cancer cases in India is high with approximately one-third of the global incidence.[1] Surgery is the mainstay of treatment for oral cancer. Resection of these lesions often leaves behind a complex three-dimensional defect, the reconstruction of which is challenging, as it has both aesthetic and functional implications.

Reconstruction options include use of local flaps, regional flaps and microvascular free flaps. The choice of flap depends on donor and recipient site factors such as the nature of the defect, (mucosal/myomucosal/bone included/overlying skin included), its size and location.

The major advantages of local flaps are - surgeons can improvise as per the particular defect and utilize a combination of flaps whenever required. Experience of using these flaps is vital for a head and neck surgeon.

We report here our experience with local flaps in reconstruction of oral cavity defects in patients who underwent radical surgery for oral cavity cancers.

METHODS

This is a retrospective review of all the cases of oral cavity cancers, in whom, after primary resection of tumour, reconstruction of resulting defects was done with local flaps. Patients treated between January 2018 to February 2021 were studied after obtaining institutional ethics committee (Homi Bhabha Cancer Hospital and Research Centre, Visakhapatnam) approval.

Patients with complete records of demographic, clinical, and surgical data, were included. Patients with small to medium sized defects that could not have been closed primarily were included while patients who had undergone local flap as rescue flap or as an adjunct with other major flaps such as the pectoralis major or with a free flap were excluded.

The site of primary, extent of resection (mucosa only vs mucosa with soft tissue vs skin inclusion vs bone inclusion), type of flap used, flap survival at two weeks and flap sequelae in terms of flap dehiscence causing fistula, flap associated trismus or donor site morbidity observed at 6 months post treatment were documented.

Flap survival at two weeks was defined as - no flap loss: a flap that has settled uneventfully; complete flap loss: a flap with need for major debridement followed by a second flap under general anaesthesia; and partial flap loss: a flap needing minor debridement under local anaesthesia with no second surgical procedure.

RESULTS

Between 2018 to 2021, 352 patients underwent surgery for oral cavity cancers. Out of 352 cases, in 46 cases post radical surgery, reconstruction with local flaps was done. With a median age of 51 years and interquartile range (IQR) of 20.5, 31 were men and 15 were women. Oral tongue was the most common subsite 56.5% (n=26) followed by buccal mucosa 15.2% (n=7), hard palate 15.2% (n=7), lip 6.52% (n=3), upper alveolus 4.34% (n=2) and floor of mouth (FOM) 2.1% (n=1). Table 1 shows clinical T stage details for various subsites. Wide excision with adequate margins and selective neck dissection was done in all of the cases.

Table 1: Distribution of primary tumor with clinical T stage.

Subsite	Stage distribution (%)				
	T1	T2	T3	T4	Total
Tongue	0	5 (19.3)	13 (50)	8 (30.7)	26
Buccal mucosa	1 (14.3)	6 (85.7)	0	0	7
Hard palate	1 (14.3)	3 (42.8)	2 (28.6)	1 (14.3)	7
Lip	0	1 (33.3)	2 (66.7)	0	3
Upper alveolus	0	2 (100)	0	0	2
Floor of mouth	0	0	1 (100)	0	1
Total					46

Overall, for the oncologic defects of oral cavity, the flaps used in order of frequency were as follows (Figure 1). FAMM flap 58.6% (n=27), nasolabial flap 15.2% (n=7) - either ipsilateral (n=4) or bilateral (n=3), infrahyoid flap 8.6% (n=4), cervicofacial flap 6.5% (n=3) - either in combination with buccal fat pad (n=2) or with Estlander flap (n=1), Estlander flap either alone or in combination with other local flaps 6.5% (n=3) and the supraclavicular flap 4.3% (n=2).

On histopathology, all patients had negative resection margins. A subsite-wise description of resection and reconstruction is as follows.

Tongue (n=26)

The resection crossed midline in 10 cases (38.4%). FOM was included in the specimen in 9 cases (34%) and ipsilateral base of tongue was included in resection in 7 cases (26.9%). Marginal mandibulectomy was done in 1 case. The facial artery myomucosal flap (FAMM) was the most commonly used flap for reconstruction of the tongue defect, done in 22 cases (84.6%) followed by the infrahyoid flap in 4 patients (15.4%) (Figures 2 and 3).

Buccal mucosa (n=7)

Wide excision with marginal mandibulectomy was performed in 4 cases (57.2%). The overlying skin was included in resection in 2 cases (28.6%). Resection included ipsilateral oral commissure and part of upper and lower lips for margin in 1 case. Reconstruction of defects was done with supraclavicular flap in 2 patients (28.6%) (Figure 4), cervicofacial flap with buccal pad of fat in 2 cases (28.6%) (Figure 5), nasolabial flap in 2 cases (28.6%) and a combination of Estlander with cervicofacial flap in another 1 case.

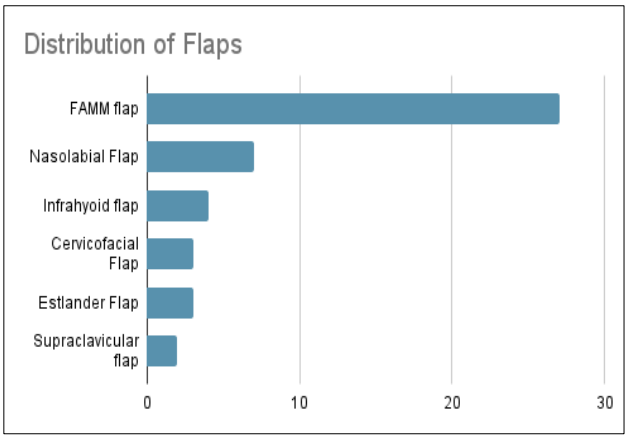

Figure 1: Distribution of flaps.

Figure 2: (a) and (b) Intra operative images of islanded right FAMM flap for right side tongue defect, and (c) 2 weeks post-operative image of FAMM flap.

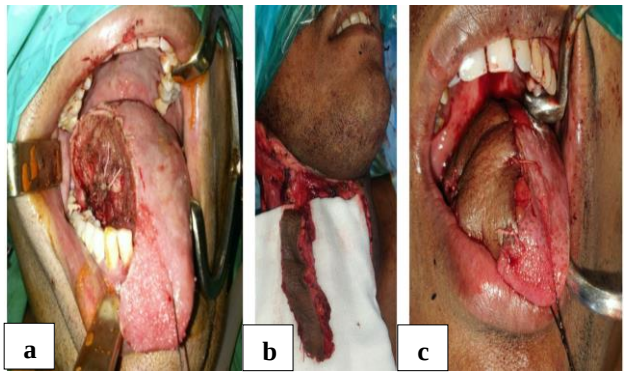

Figure 3: (a), (b), and (c) Intra operative images of right Infrahyoid flap for right side tongue defect.

Hard palate (n=7)

Post-resection defects in this series as per the Liverpool classification of maxillectomy defects[2] were of type IIa in 5 cases (71.4%) and type IIc in 2 (28.6%). The flap most commonly deployed was the FAMM flap in 4 cases (57.1%) followed by bilateral nasolabial flap in 2 cases (28.6%) (Figure 6) and ipsilateral nasolabial flap in 1 case.

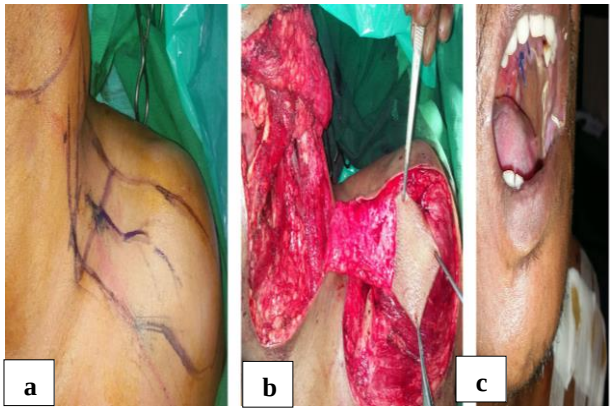

Figure 4: (a) and (b) Intra operative images of left supraclavicular flap for left buccal mucosa defect, and (c) 2 weeks post-operative image of supraclavicular flap.

Figure 5: Cervicofacial flap for buccal mucosa defect.

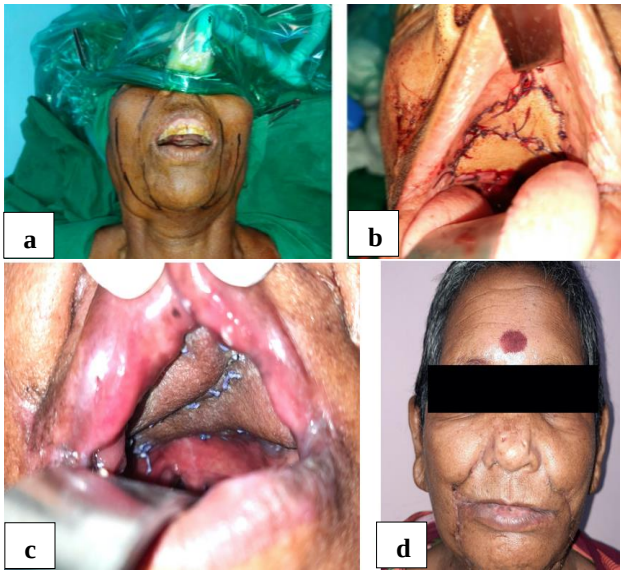

Figure 6: (a) and (b) Intra-operative images for superiorly based bilateral nasolabial flap for palatal defect, (c) two weeks postoperative image of intra oral flap, and (d) two weeks postoperative image showing minimal facial scarring.

Lip (n=3)

Upper lip resection was carried out in 1 case. This was reconstructed using bilateral nasolabial flap. Upper lip resection with marginal mandibulectomy followed by a Gillies fan flap repair was performed in another case. Peri-commissural carcinoma was excised and repaired with the Estlander flap in 1 case (Figure 7).

Upper alveolus (n=2)

Resection included a portion of upper lip and adjoining skin in 1 case resulting in a type IIa defect of the maxilla. The skin defect measured 2×2cms; the defect was reconstructed with an Estlander flap and split skin graft harvested from the thigh. In the other case of type IIa defect of upper alveolus, reconstruction was done with a nasolabial flap.

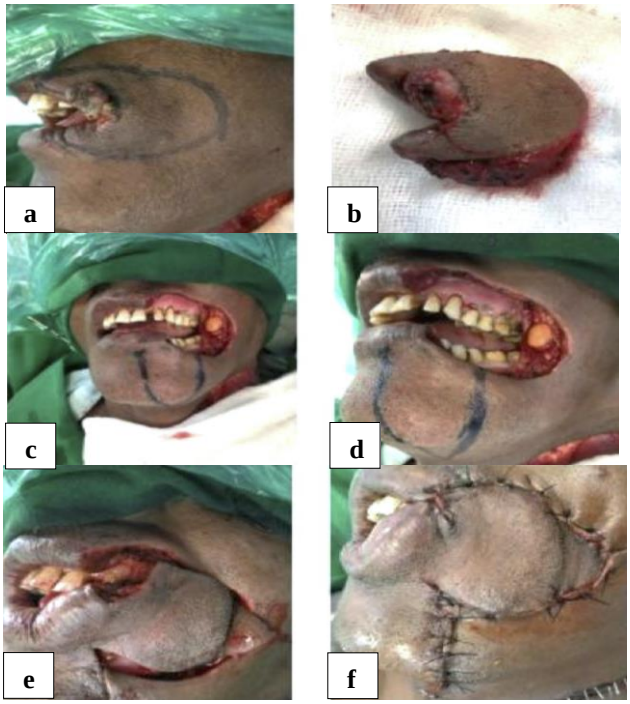

Figure 7: Estlander flap for reconstruction of left commissure and buccal mucosa defect.

Floor of mouth (FOM) (n=1)

Resection with marginal mandibulectomy was reconstructed with FAMM flap harvested from the ipsilateral buccal mucosa.

Flap outcomes

Flap survival was estimated at 2 weeks post-surgery. No complete loss of flap was identified while 5 patients (10.4%) had partial flap loss. All these were patients with tongue defects, reconstructed with FAMM (2/5) and infrahyoid flap (3/5). Partial loss of FAMM flap was recorded in 2 patients which healed with secondary granulation. Partial skin paddle loss was noticed in 3 cases of infrahyoid flap; the underlying muscle was viable and minimal debridement under local anesthesia was the only intervention required. The mean duration to partial skin paddle loss was noted to be 8 days (range-6-11 days). Partial flap loss could be attributed to venous congestion.

The only significant long-term morbidity that was flap related, in this study, as noted at 6 months post treatment was reduced mouth opening, which was of moderate grade 3 (16–25 mm interincisor distance) in 5 patients and severe grade 3 (<15 mm inter incisor distance) in 1 patient with FAMM flap reconstruction.

Resumption of oral diet

Oral sips of water and clear fluids were started for all the patients by POD 9, as protocol. It was delayed to an average of 15 days in patients with partial loss of flap.

Adjuvant treatment

Of the 48 patients, 26 patients required adjuvant therapy. All these 26 patients underwent the same without any delay attributable to wound/flap healing issues.

DISCUSSION

Reconstruction of oral cavity oncologic defects after radical surgery for oral cavity cancers remains a challenge. The choice of reconstruction needs to be based on the defect size, location and relevant patient factors.

For large, composite defects of the oral cavity, reconstruction usually is done with microvascular free flaps in coordination with plastic and reconstructive units whenever feasible. For the small to moderate defects, local flaps are an option that provide acceptable outcomes. As seen in this study, a variety of local flaps can be used for oral cavity reconstruction, either alone or in combination. These provide excellent cover for mucosal, soft tissue and partial bone defects. FAMM flap was the most commonly used local flap for small to medium oral cavity defects at our centre, as observed in this retrospective study. This flap was first described by Pribaz in 1992 as a reliable and versatile flap.[4] Ibrahim et al compared the radial forearm free flap and the FAMM flap for reconstruction of oral cavity defects post ablation and reported that FAMM flap is associated with lower costs, shorter OR time, similar functional outcomes and a tendency to lower complication rates.[5] The only significant morbidity associated with this flap is donor site fibrosis leading to postoperative trismus. We noticed this complication in 6 patients which was overcome with regular jaw stretching exercises as advised by the physiotherapist. Further, gradual jaw stretching exercises were incorporated in the immediate postoperative period in all subsequent patients who underwent FAMM flap, which reduced the long-term incidence of this complication.

The other local flap used extensively for reconstruction of oral cavity defects is the nasolabial flap. It has been described as a versatile local flap with a robust blood supply.[6] This flap is highly vascular as it is based on the facial artery and the rich subdermal plexus supplying the skin flap allowing it to withstand adjuvant radiotherapy without undergoing necrosis.[7] We have used nasolabial flap primarily for reconstruction of palatal defects in elderly reverse smokers who were not good candidates for microvascular procedures. Flap necrosis or dehiscences were not observed in any of the patients. There was no aesthetic concern as the scar was well hidden within the nasolabial groove.

Infrahyoid flap has been used in our centre for reconstruction of tongue defects. It is referenced in literature to be a reliable and successful alternative to free flaps for reconstruction of oral cavity defects.[8] We experienced partial skin paddle loss in 3 patients of infrahyoid flap, which started as skin discoloration in the early postoperative period and progressed to partial skin necrosis by the end of week 1.

In all cases, debridement under local anesthesia was sufficient. The occurrence of this complication, as seen in literature, ranges from 3-47% and is attributed to the damage of perforators supplying the skin paddle and inadequate venous drainage.[9]

İşlek et al in their series of 5 patients with tongue and FOM cancer in whom reconstruction was done with infrahyoid flap also reported similar complication as our study, with partial skin paddle necrosis noticed in 2 patients.[8]

The Estlander flap is considered a workhorse flap for the reconstruction of commissure defects involving either upper or lower lip.[10] In our patients with Estlander flap, there were no postoperative complications; all patients had satisfactory oral competence, oral diet and acceptable mouth opening (Figure 8). Cheng at al reported similar results with good oral competence in patients reconstructed with estlander flap for commissure/lip carcinoma.[11]

Gillies fan flap, considered an extension of the Estlander flap, employed for reconstruction of larger lip defects, allows for total lip reconstruction.[12] We have used it for the reconstruction of lower lip defect in 1 patient with no ensuing flap complications.

Thus, significant complications were seen only with the infrahyoid and FAMM flaps, even these only requiring minimal intervention. Our complications can be graded as Grade IIIa, as per the Clavien-Dindo classification.[13]

Postoperative adjuvant radiation therapy did not influence the flap healing and did not contribute to complications in our study. This is similar to the findings of Wang et al whose results suggested good radiation tolerance of reconstructive flaps after radical tumour excision in the head and neck region.[14]

Figure 8: 6 months post operative image of Estlander flap for reconstruction of left commissure and buccal mucosa defect.

Although our study is retrospective, it gives an overview of the various local flaps that can be utilised in oral cavity reconstruction while also providing an insight into the various complications that can arise with the use of these flaps and on the management of those.

CONCLUSION

Local flaps are an excellent option for small to medium sized oral cavity oncologic defects. These flaps can be improvised and adapted as required in the particular case. In context of the limited resources and logistic issues that exist in most cancer centres of the Indian subcontinent, these flaps are the surgeon's ally to providing good outcomes and quicker patient recovery.

Recommendations

Reconstruction with local flaps after radical surgery for oral cavity cancers is a feasible alternative. Advantages include ease of harvest, reliable vascularity, adaptability, compatibility with the recipient site

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